Drinking Water Safety in Newfoundland and Labrador

Annual Report 2012

Drinking Water Safety
in Newfoundland and Labrador

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2012

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Contents

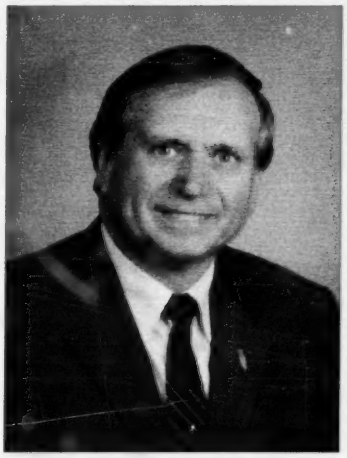
Message from the Minister	i
Executive Summary	ii
Figures	iii
Tables	iii
Weblinks	iv
Introduction	1
Highlights and Accomplishments	2
Level I	3
Source Water Protection	3
Drinking Water Treatment	8
Drinking Water Distribution	10
Level II	12
Monitoring	12
Data Management and Reporting	18
Inspection and Enforcement	21
Operator Education, Training, and Certification	23
Corrective Measures	26
Level III	29
Legislative and Policy Frameworks	29
Public Involvement and Awareness	30
Guidelines, Standards, and Objectives	30
Research and Development	30
The Path Forward	31
Department of Environment and Conservation	31
Department of Health and Community Services	31
Department of Municipal Affairs	32
Service NL	33

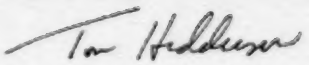
Message from the Minister

As the Minister for the Department of Environment and Conservation, I am pleased to present the annual Drinking Water Safety in Newfoundland and Labrador report for 2012. This annual report outlines the accomplishments and activities for 2011–12 under the Multi-Barrier Strategic Action Plan (MBSAP). The province of Newfoundland and Labrador adopted a Multi-Barrier Strategic Action Plan in 2001 to ensure the safety of drinking water for residents of Newfoundland and Labrador. This strategy is considered to be the most effective method of managing drinking water systems.

The province's MBSAP incorporates an extensive source water protection program, thorough drinking water quality monitoring program, and data management and reporting programs that protect drinking water. Innovative training opportunities are also provided for operators of drinking water distribution systems, with an emphasis on smaller communities in the province. The Province will work to strengthen these programs by identifying and addressing areas for improvement within each component of the MBSAP.

I would like to acknowledge the hard work of municipal governments in the provision of high quality drinking water to their citizens. I also commend the efforts of the Technical Working Group, which encompasses the Departments of Environment and Conservation, Health and Community Services, Municipal Affairs, and Service NL, as well as the province's regional Health Authorities.





Honourable Tom Hedderson
Minister of Environment and Conservation

Executive Summary

This is the eleventh annual report prepared by the Department of Environment and Conservation (ENVC), Government of Newfoundland and Labrador. This report describes the initiatives, activities and accomplishments of the various departments in carrying out the Multi-Barrier Strategic Action Plan (MBSAP) for the 2011–12 fiscal year (April 1, 2011 to March 31, 2012).

The first section of the report focuses on Level I of the MBSAP. This level includes source protection, drinking water treatment, and drinking water distribution. There are 483 public water supply sources in the province, 314 of which are protected under Section 39 of the *Water Resources Act*. Ninety-one percent of the serviced population in the province of Newfoundland and Labrador use water from protected drinking water sources. Twenty-six water treatment plants are in operation in Newfoundland and Labrador (7 of which are potable water dispensing units). In 2011–12, nine water treatment systems were upgraded with new chlorination equipment.

The second section of this report focuses on Level II of the MBSAP. This level includes monitoring of the province's drinking water quality, inspection and enforcement, data management and reporting, operator education, training and certification, and corrective measures.

A few of the many items highlighted in this section are:

- analysis of 3,814 inorganic and disinfection by-product samples
- analysis of 19,634 bacteriological samples
- preparation and mailout of 964 seasonal drinking water quality reports, and 361 annual reports to communities
- preparation of 156 water supply and water and sewer system permits
- recognition of water operators working in the province through the annual "Operator of the Year" awards
- administration of 157 on-site training sessions

The third section of this report focuses on the final level of the MBSAP. Level III is composed of legislation and policy frameworks, public involvement and awareness, guidelines, standards and objectives, and research and development. This section of the report discusses the stakeholders involved in the implementation of the MBSAP, such as the different levels of government and the public. In addition, it defines the legislation that governs drinking water quality and infrastructure in the province of Newfoundland and Labrador. Highlights include accomplishments of the Interdepartmental Safe Drinking Water Technical Working Group, efforts to increase public involvement and awareness of drinking water quality and related issues in the province, new initiatives, and research and development projects that the province has been working on throughout the 2011–12 fiscal year.

The Path Forward section of the report outlines the Government of Newfoundland and Labrador's plans for the 2012–13 fiscal year. The Government of Newfoundland and Labrador remains committed to ensuring the safety of the province's drinking water through action at all levels of the MBSAP. The Departments of Environment and Conservation, Health and Community Services, Municipal Affairs and Service NL work collaboratively to achieve the goals of the MBSAP, and to enforce regulations and guidelines regarding drinking water safety.

Figures

Figure 1: The Multi-Barrier Strategic Action Plan 1
Figure 2: Status of Public Water Sources 3
Figure 3: Development Permits by Section 6
Figure 4: Permits Issued per Fiscal Year 6
Figure 5: Chlorination Systems Used in Newfoundland and Labrador 9
Figure 6: Water Treatment Plants per Fiscal Year 10
Figure 7: Bacteriological Samples Tested per Fiscal Year 12
Figure 8: Unsatisfactory Bacteriological Samples per Fiscal Year 13
Figure 9: Number of BWAs and Number of Communities Affected 14
Figure 10: Reasons for BWAs 14
Figure 11: Percent Compliance of ENVC's Sampling Schedule per Fiscal Year 16
Figure 12: Number of Reports Published by ENVC per Fiscal Year 19
Figure 13: Number of Permits to Construct per Fiscal Year 22
Figure 14: Number of Certified Operators by Calendar Year 25
Figure 15: Number of Workshop Attendees per Fiscal Year 26

Tables

Table 1: Number of Referrals Processed 6
Table 2: Number of Disinfection Systems in Newfoundland and Labrador 8
Table 3: Number of Water Treatment Systems in Newfoundland and Labrador 9
Table 4: Public Water Distribution System Classes for 2011–12 11
Table 5: Funding Approved by Department of Municipal Affairs 11
Table 6: Number of Bacteriological Samples Tested in Each Region for 2011–12 13
Table 7: Number of Unsatisfactory Samples for Total Coliforms for 2011–12 13
Table 8: Number of Unsatisfactory Samples for *E. coli* for 2011–12 13
Table 9: Number of Samples Taken by ENVC for 2011–12 15
Table 10: Number of Samples Scheduled and Collected by ENVC for 2011–12 15
Table 11: Exceedances for the 2009–10, 2010–11 and 2011–12 Fiscal Years 17
Table 12: Types of Public Reports Produced by ENVC 21
Table 13: Inspections by ENVC for 2011–12 23
Table 14: Total Number of Operator Certificates Issued per Calendar Year 25
Table 15: Corrective Measures Undertaken for 2011–12 27

Weblinks:

Department of Environment and Conservation
http://www.env.gov.nl.ca/env/index.html

Newfoundland and Labrador *Water Resources Act* SNL 2002 cW-4.01
http://www.assembly.nl.ca/Legislation/sr/statutes/w04-01.htm

Water Resources Management Division Reports and Publications
http://www.env.gov.nl.ca/env/waterres/reports/index.html

Newfoundland and Labrador Water Resources Portal
http://maps.gov.nl.ca/water/

Protected Water Supply Area List and GIS Layers
http://www.env.gov.nl.ca/env/waterres/gis/index.html

Guidelines for Canadian Drinking Water Quality: Summary Table
http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2012-sum_guide-res_recom/index-eng.php

Standards for Bacteriological Quality of Drinking Water
http://www.env.gov.nl.ca/env/waterres/regulations/policies/standards_microbiological.html

Standards for Chemical and Physical Monitoring of Drinking Water
http://www.env.gov.nl.ca/env/waterres/regulations/policies/physical_monitoring.html

Policy for Drinking Water Quality Monitoring and Reporting for Public Water Supplies
http://www.env.gov.nl.ca/env/waterres/regulations/policies/water_quality.html

Department of Environment and Conservation Drinking Water Quality Data
http://www.env.gov.nl.ca/env/waterres/quality/drinkingwater/chemical.html

Acts, Regulations, Policy Directives, and Water Quality Standards
http://www.env.gov.nl.ca/env/waterres/regulations/policies/index.html

Operator Education, Training, and Certification
http://www.env.gov.nl.ca/env/waterres/training/index.html

Guidelines for the Design, Construction, and Operation of Water and Sewerage Systems
http://www.env.gov.nl.ca/env/waterres/waste/groundwater/report.html

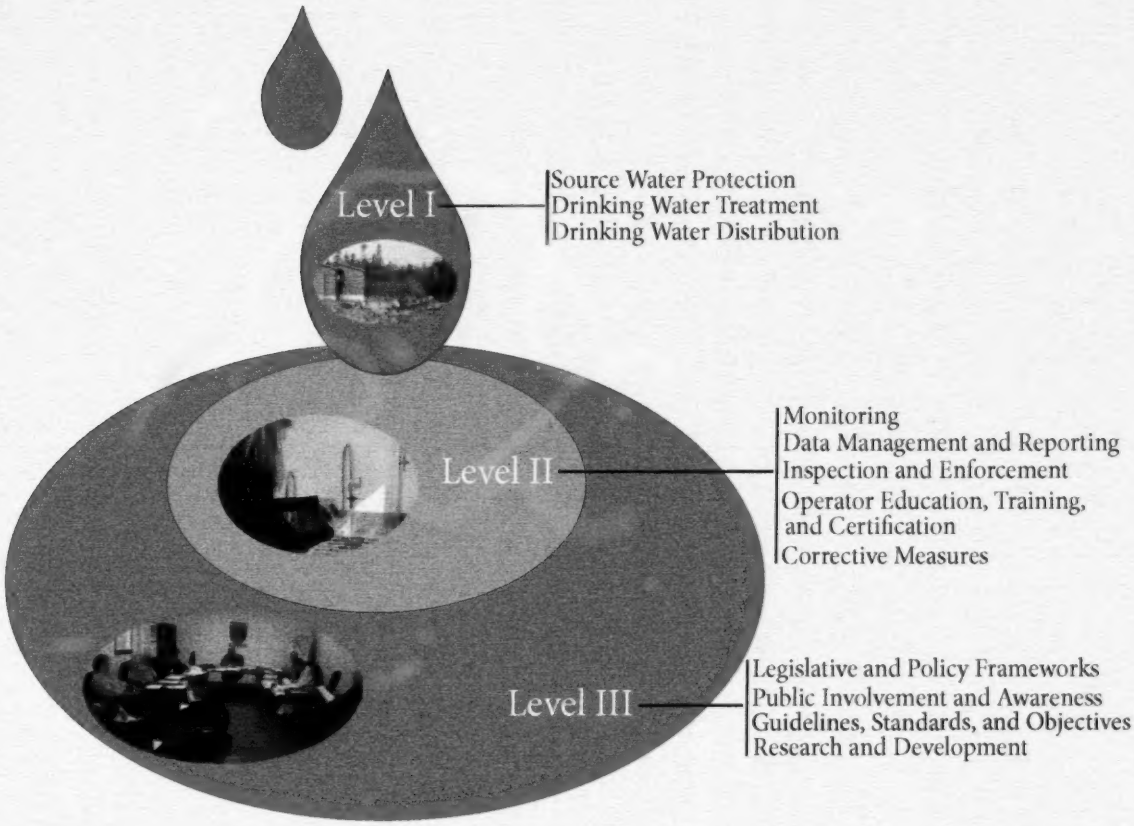
Best Management Practices for the Control of Disinfection By-products in Drinking Water Systems in Newfoundland and Labrador
http://www.env.gov.nl.ca/env/waterres/reports/cwws/index.html

Introduction

This is the eleventh annual report prepared by the Department of Environment and Conservation (ENVC). This report highlights the initiatives, activities, and accomplishments made by the departments that are responsible for the implementation of the Multi-Barrier Strategic Action Plan (MBSAP) in the 2011–12 fiscal year (April 1, 2011 to March 31, 2012). The report describes the three levels of the MBSAP and their various components. It illustrates how Government is implementing the MBSAP, and describes the intended path forward, and plans for future implementation of the MBSAP.

The MBSAP is considered to be the most effective method of managing drinking water systems and has been implemented by other jurisdictions throughout Canada. The MBSAP adapted by Newfoundland and Labrador has three levels, as illustrated in Figure 1.

Figure 1: The Multi-Barrier Strategic Action Plan

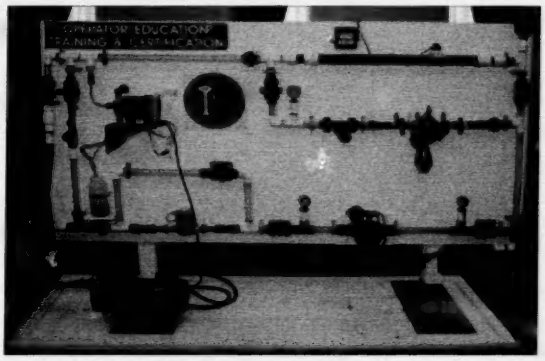


The implementation of the MBSAP involves the collaborative efforts of four provincial government departments:

1. Environment and Conservation (acting as the lead agency)
2. Health and Community Services
3. Municipal Affairs
4. Service NL

Highlights and Accomplishments

In this report, indicators are reported for various components of the MBSAP. Information is reported for the current fiscal year alongside of previous fiscal years, to evaluate performance of the existing drinking water framework. In addition, illustrations of technical work related to drinking water in this province are highlighted.



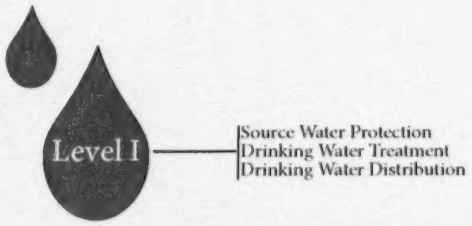
Water distribution system working model

Highlights of MBSAP component indicators for the 2011–12 fiscal year include:

- 314 protected public water supply areas in the province
- 166 land use referrals reviewed for proposed activities concerning protected public water supply areas
- 3 watershed management plans
- 5 watershed management committees
- 106 drinking water treatment systems and 480 disinfection systems
- $17,543,000 approved by the Department of Municipal Affairs for water infrastructure projects
- 211 active boil water advisories as of March 31, 2012
- 3,814 chemical and physical water quality samples, 19,634 bacteriological samples taken
- Table 11 on page 17 contains bacteriological and chemical drinking water quality exceedances for the fiscal year
- 1,325 community drinking water quality reports published
- 156 permits to construct for water and sewer infrastructure
- 330 active permits to operate water distribution systems, 16 active permits to operate water treatment systems
- 149 regulatory inspections performed
- 14 education and 157 on - site training seminars conducted by ENVC
- 356 certified water and/or wastewater system operators employed in the province
- 318 participants at the 2012 Annual Drinking Water Safety Workshop
- Table 15 on page 27 highlights corrective measures undertaken
- Policy for Newfoundland and Labrador Water and Wastewater Operator Certification Program

Level I

The components of the first level of the MBSAP protect drinking water from the source to the tap.



The three components of Level I of the MBSAP are:

1. source water protection
2. drinking water treatment
3. drinking water distribution

Source Water Protection

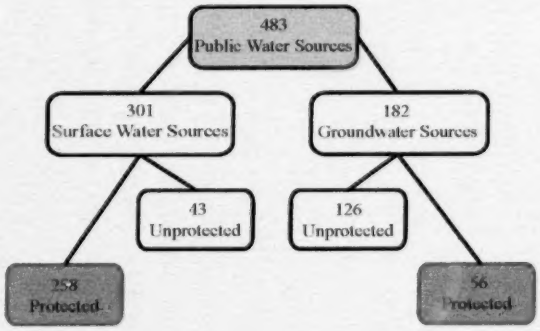
Protecting public drinking water sources is the first step in a multi-barrier approach to maintaining a supply of clean and safe drinking water for communities.

Public drinking water in the province is from two types of sources: surface water (rivers, ponds, and lakes) and groundwater (drilled and dug wells). Each source type presents its own set of risks and potential hazards that can contaminate drinking water. Source protection of drinking water helps protect public health and reduces the cost involved in treating public drinking water.

Section 39 of the *Water Resources Act*, SNL 2002 cW-4.01 protects public drinking water sources. Once protected, these areas are classified as protected public water supply area(s) for surface water supplies, and wellhead protected water supply area(s) for groundwater supplies. Establishing protection is a cooperative process that is initiated by individual communities.

There are 483 public water sources (PWS) in the province of Newfoundland and Labrador. Of these, 301 are surface water sources and 182 are groundwater sources. In total, 314 sources are designated as protected public water supply areas (PPWSAs) as of the end of the 2011–12 fiscal year. These PPWSAs service a population of 372,212, representing 91% of the serviced population. Figure 2 shows the status of public water sources for fiscal year 2011–12.

Figure 2: Status of Public Water Sources



The Department of Environment and Conservation encourages all communities to begin the protection process for new or existing drinking water sources.

Wrights Brook, public water supply, Town of Portugal Cove South

Wellhead Protected Water Supply Area

Many communities in the province use groundwater as a source for drinking water. Most groundwater sources provide clean and safe drinking water.

Groundwater is not confined to only a few channels or depressions in the same way that surface water is concentrated in streams and lakes. Rather, it exists almost everywhere underground. It is found underground in the spaces between particles of rock and soil, or in crevices and cracks in rock.

The source of this water (recharge) can originate from surface water bodies or from precipitation that falls and infiltrates through the ground. Groundwater may take years to thousands of years to travel through aquifers before it is pumped from a well.

Any addition of undesirable substances to groundwater caused by human activities is considered to be contamination. It has often been assumed that contaminants left on or under the ground will stay there. However groundwater often spreads the effects of dumps and spills far beyond the site of the original contamination. Groundwater contamination is extremely difficult, expensive, and sometimes impossible, to clean up.

Wells that are drilled into aquifers that supply drinking water can draw contaminated water from affected areas into the water supply. Therefore, it is important to protect recharge areas where precipitation or other sources of water enter the ground in order to protect drinking water.

The Wellhead Protected Water Supply Area (WPWSA) is designed to protect the recharge area that supplies water to the aquifer used for public supply. A WPWSA provides the best possible protection for the source of the aquifer water and is a way to protect drinking water by managing potential sources of contamination. Much can be done to prevent pollution, such as the wise use of land and chemicals. Public health is protected and the expense of treating polluted water or drilling new wells is avoided though wellhead protection efforts.

The Water Resources Management Division strongly encourages all communities serviced by public water supply wells to submit an Application For Protection of a Public Groundwater Supply Area(s) found at *http://www.env.gov.nl.ca/env/waterres/regulations/appforms/index.html.*

Watershed Management

The Water Resources Management Division (WRMD) of the Department of Environment and Conservation (ENVC) regulates development activities within protected public water supply areas. WRMD uses a number of tools to monitor such activities, including:

- referrals from the Interdepartmental Land Use Committee (ILUC), Crown Lands, Natural Resources, Municipal Affairs and other agencies (Environmental Assessment (EA))
- permits for development
- watershed management plans
- watershed management committees

The watersheds that supply our drinking water are often also used for other human needs and enjoyment, such as commercial and domestic forestry, mineral resource development, cabin development, and recreation. These same watersheds are home to wildlife and are functioning ecosystems. All of these uses can still co-exist with the supply of safe drinking water, if they are regulated under a long-term management strategy.

ENVC promotes the development of long-term watershed management plans for designated areas so that resource utilization can be optimized on a planned and orderly basis without impairing water quality. Management plans should outline the details of the proposed activities and the environmental protection measures designed to minimize adverse impacts on water quality. The plan also contains water quality monitoring programs to assess the effects of the development activities on the watershed.

There are three communities with watershed management plans in the province:

1. Corner Brook
2. Gander
3. Steady Brook

In order to prepare a watershed management plan, a community must first decide on goals that the plan will address. The primary goal would include the protection of water quality while allowing for traditional activities and developments that are considered sustainable.

Any development activity proposed in a protected area will require approval from ENVC. A development activity is defined as the carrying out of any activity or operations on, over or under land or water for social or economic benefits, or any change in the use or the intensity of use, of any land, water, building or premises. The proponent will have to apply for a development permit using the application form for a permit for a development activity in a protected public water supply area.

When a development permit application is received, the municipal authority responsible for the protected water supply area is contacted. This provides an opportunity for the municipal authority to bring forward any objections or concerns regarding the development activity. It also provides an opportunity for the municipal authority to suggest conditions under which the proposed development may be able to proceed.

Section 39 of the *Water Resources Act* details activities that are prohibited from protected public water supply areas. Any violation of this constitutes an offense under Section 90 of the *Water Resources Act*. Additional details on developments within protected public water supplies are found in the policy directive: W.R. 95-01 *Policy for Land and Water Related Developments in Protected Public Water Supply Areas*, which can be found online at: *http://www.env.gov.nl.ca/env/waterres/regulations/policies/index.html.*

Referrals

In the 2011–12 fiscal year, the WRMD processed 166 referrals from various departments for proposed activities concerning PPWSAs as outlined in Table 1.

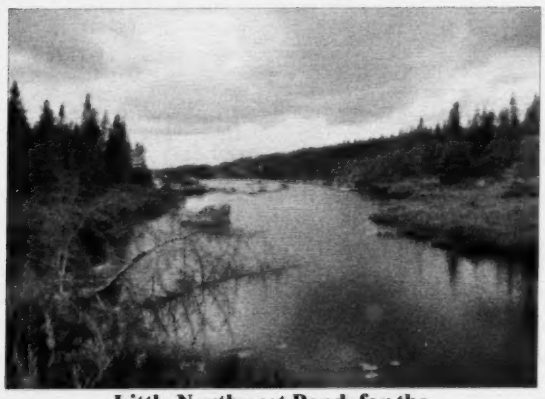
If activities are within a protected public water supply area, the WRMD provides recommendations to the respective department(s) and requests that an application be submitted to the division, as per regulatory requirements. The purpose is to control the development or activity inside the designated boundary of a PPWSA to ensure that it will have either no impact or negligible impact on drinking water quality and/or quantity.

Table 1: Number of Referrals Processed

Type of Referral	Count
Crown Land	70
Interdepartmental Land Use Committee	33
Municipal Affairs	10
Natural Resources	43
Other	10
Total	166

Activity Permits

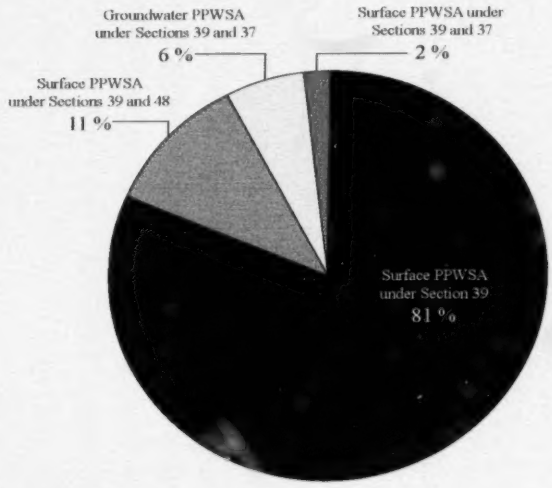
All activities in a PPWSA (either a protected public water supply area, or a wellhead protected water supply area) require a permit.



Little Northwest Pond, for the Town of New-Wes-Valley, PPWSA

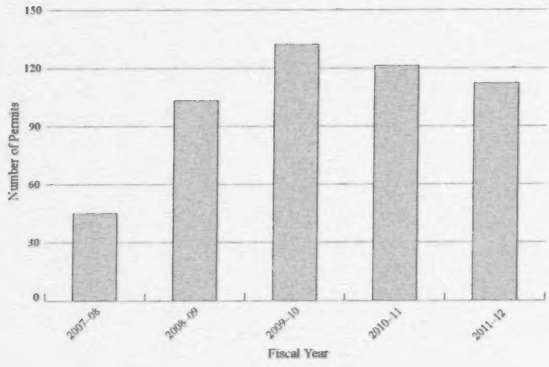
The proponent of an activity in a PPWSA is responsible for obtaining a permit for the activity. Under the *Water Resources Act* for the 2011–12 fiscal year, 112 development activity permits were issued: Figure 3 illustrates the distribution of development permits by Section. Figure 4 shows the total number of permits issued for development activities within a PPWSA for each fiscal year since 2007–08.

Figure 3: Development Permits by Section


Groundwater PPWSA under Sections 39 and 37
6 %
Surface PPWSA under Sections 39 and 37
2 %
Surface PPWSA under Sections 39 and 48
11 %
Surface PPWSA under Section 39
81 %

** Section 39 - permits for development in a PPWSA, Section 48 - permits to alter a body of water, Section 37 - permits to construct-water*

Figure 4: Permits Issued per Fiscal Year



Integrated Watershed Management in Canada

What does the term Integrated Watershed Management (IWM) mean to you? It's a concept that's been around for quite some time and is ever evolving. In October of 2009, the Canadian Council of Ministers of the Environment endorsed a Canada-wide strategic vision for water, which outlines how to help ensure that Canadians have access to clean, safe and sufficient water to meet their needs in ways that also maintain ecosystem integrity. Goal 1 of the implementation plan is "Aquatic ecosystems are protected on a sustainable watershed basis", with the rationale of enhancing the understanding and application of the concept of IWM in Canada.

Under the direction of the Water Agenda Development Committee, a subgroup was formed in 2010 to lead the development of a Canadian IWM scoping document. This document aims to identify IWM principals, compare Canadian jurisdictional governance mechanisms as well as compare international experience. Each Canadian province and territory is represented on the IWM Sub-Group and meets monthly via conference call.

Through this scoping document, IWM in Canada has been defined as a continuous adaptive process of managing human activities and ecosystems in a defined watershed that integrates multiple concepts and methods, including water and land use planning and management (e.g. protected areas, source water protection, etc.) and evaluates and manages cumulative effects from multiple environmental stressors. IWM is intended to bring together many aspects of watershed governance such as policy, planning, and legislation as well as stakeholders in an effort to build working relationships.

In Newfoundland and Labrador, IWM is focused mainly on source water protection. Municipalities are responsible to apply to the Department of Environment and Conservation for protection of their public water supplies under the *Water Resources Act* (2002). Activities within a protected watershed are managed through a permitting system administered through the Water Resources Management Division (WRMD). All activities or developments are analyzed on a case by case basis by Environmental Scientists with the Department. IWM is a balanced, ecosystem based approach to development that aims to protect one of our most precious resources. This province is proud to be a part of this IWM initiative.

Watershed Management Committees

Watershed management committees are formed to oversee land use management, and development and conflict resolution activities inside a PPWSA. Stakeholders on such committees typically include town council members, town residents, representatives from industry involved in development activities in the area, Department of Environment and Conservation staff, other departmental government staff, members of environmental groups, and other concerned parties. The active watershed management committees in the province during 2011–12 are located in:

- Clarenville
- Corner Brook
- Gander
- Grand Falls–Windsor
- Steady Brook

Drinking Water Treatment

Drinking water treatment refers to the processes that remove contaminants or adjust aesthetic parameters in source water, by the addition of chemicals, filtration, and/or other processes to meet drinking water quality guidelines. Each water source in the province has unique water chemistry, and potential for contamination according to its location and the development activities within its watershed area. Several water treatment strategies are used in the province to address the different scenarios, and provide unique solutions to treat the water before it is consumed.

Disinfection

The most critical aspect of water treatment is disinfection. While there are several forms of disinfection used in the treatment of drinking water, chlorination is recognized as the most feasible and practical disinfectant and is the most commonly used disinfection method in the province. It is used as one of three types (sodium hypochlorite, calcium hypochlorite, and chlorine gas) by communities across the province. When used in drinking water treatment, chlorine disinfects water and minimizes microbial growth in the distribution system. However, chlorine can also create disinfection by-products (DBPs) such as trihalomethanes (THMs) and haloacetic acids (HAAs). While minimizing disinfection by-products is important, the risks of not disinfecting drinking water far outweigh any risks DBPs may cause. To ensure that drinking water remains safe, it is essential that the optimal level of chlorine is maintained throughout the system. Other disinfection methods used in the province are outlined in Table 2.

Table 2: Number of Disinfection Systems in Newfoundland and Labrador

Disinfection Systems	Count
Chlorination	437
Ultraviolet Light (UV)	30
Mixed Oxidants (MIOX)	6
Ozone	4
Chloramines	2
On-site Generation	1

Ultraviolet Light (UV): Water passes through an ultraviolet irradiation chamber and the ultraviolet rays de-activate any microbes in the water. UV is less effective in treating water with high turbidity and colour. A secondary disinfectant is required to maintain a detectable chlorine residual in all areas of the distribution system.

Mixed Oxidants: Uses salt, water and electricity to produce a concentrated solution of oxidants that disinfects source water and generally improves the taste and odour of drinking water.

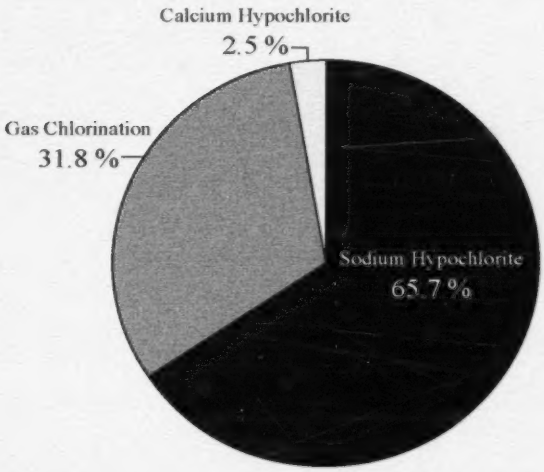
Ozone: Created by passing dry, clean, air between two high-voltage electrodes in an ozone generator. The ozone is then injected into the water where it de-activates microbial agents. It also removes colour, taste, and odour from the water. A secondary disinfectant is required to maintain a detectable chlorine residual in all areas of the distribution system.

Chloramines: Chloramines are formed from chlorine and ammonia. Use of chloramines include final disinfection, and taste and odour control. Chloramines' persistence allow it to reach remote areas in the distribution system, penetrate biofilms, and contribute to lower formation levels of THMs and other DBPs,

On-site Generation (OSG): On-site generation of sodium hypochlorite is a simple and basic process using salt, water and electricity. On-site generating systems work by running softened water into the salt dissolver. The salt is dissolved forming a brine solution, which is subsequently passed through electrolytic cells where low voltage (DC) current is applied to the brine, producing sodium hypochlorite.

Figure 5 illustrates the distribution of different chlorination types in the province during 2011–12.

Figure 5: Chlorination Systems Used in Newfoundland and Labrador



Parameter Specific Drinking Water Treatment

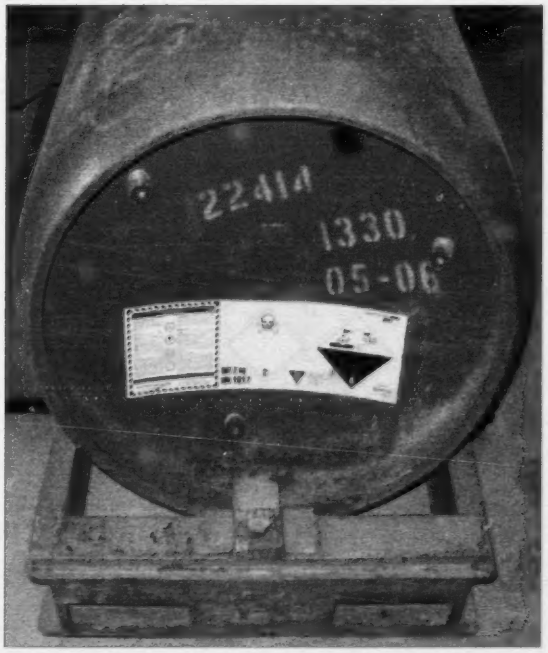
Mitigative measures have been implemented in numerous drinking water systems to alleviate parameter specific water quality challenges. Although not full-scale treatment plants, the following corrective measures have been implemented throughout the province:

- screening (infiltration gallery)
- filtration
- pH adjustment
- arsenic removal
- iron/manganese removal
- lead removal
- strontium removal

Table 3 shows the number of specific drinking water treatment systems in the province for the 2011–12 fiscal year.

Table 3: Number of Water Treatment Systems in Newfoundland and Labrador

Drinking Water Treatment Systems	Count
pH adjustment	43
Micron/pressure filters	25
Infiltration galleries	20
Arsenic removal	9
Iron/manganese removal	7
Lead removal	1
Strontium removal	1

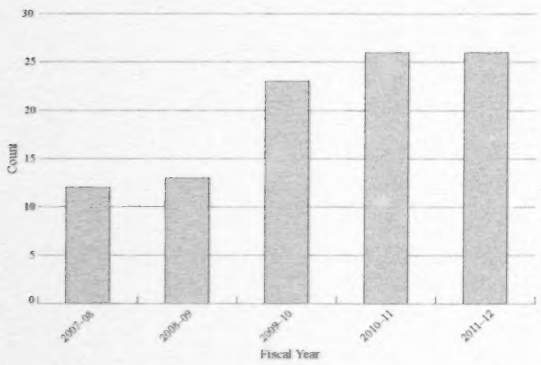


Chlorine gas tonner, Channel - Port aux Basques Water Treatment Plant, Newfoundland

Water Treatment Plants

As of March 31, 2012, 26 water treatment plants are in place in Newfoundland and Labrador (this number includes 7 potable water dispensing units). Figure 6 illustrates the total number of water treatment plants in Newfoundland and Labrador for each fiscal year since 2007–08. These plants use a range of treatment processes in addition to disinfection.

Figure 6: Water Treatment Plants per Fiscal Year



If a water treatment plant is deemed necessary to ensure good water quality, municipalities must assess and implement a cost effective solution. The Departments of Environment and Conservation and Municipal Affairs have developed a procedure for municipalities considering a water treatment plant. Under this procedure, the municipality establishes a Steering Committee to oversee the technical and administrative aspects of the selection and implementation process. This committee will consist of representatives from the town council, ENVC and the Department of Municipal Affairs and others as deemed necessary. Depending on the overall project scope of work, the Steering Committee will determine the project delivery method which will incorporate the selection, supply and installation of the most appropriate treatment process through a Request for Proposals (RFP) process. The municipality must engage an engineering consultant to aid in selecting an appropriate water treatment technology and in administering its construction. For contracts awarded via a RFP process, the engineering consultant will act as the municipality's agent for design review and construction project management; shop drawings review; site inspection/quality assurance; etc, during the design and construction stages of the successful proponent's contract. Using the approved design flow and water quality objectives, the most appropriate cost effective treatment process must be chosen from a variety of available treatment processes by the RFP process. Cost effectiveness is based upon life cycle costs including capital and operation & maintenance costs over 25 years. Prior to final acceptance of the recommended treatment process, bench modeling and/or on-site pilot testing may be required.

A full-scale water treatment plant is not a feasible solution for all communities. An alternative solution to the treatment challenge for smaller communities is the use of small scale drinking water treatment systems - potable water dispensing units (PWDUs), which are configured to respond to a community's specific drinking water quality issues.

Drinking Water Distribution

The distribution system is the largest component of physical infrastructure that ensures drinking water safety. It includes all the pipes, valves, service lines, pumping stations, fire hydrants, and storage facilities required to deliver clean and safe drinking water.

In the 2011–12 fiscal year there were 514 public water distribution systems in Newfoundland and Labrador. Table 4 shows the breakdown

of the number of water distribution systems in the province for 2011–12. Seventy percent of public water distribution systems in Newfoundland and Labrador fall into the "very small" classification, as they serve populations of 500 or fewer people. These very small systems face two major challenges:

1. Operation and maintenance: Successful ongoing operation and maintenance includes employing and retaining qualified and trained operators. This can be difficult in rural areas that are experiencing changing demographics.
2. Administration: Many communities with very small systems, serve small populations spread over large geographic areas, which increases the challenges associated with providing safe drinking water and maintaining the water supply systems.

Table 4: Public Water Distribution System Classes for 2011–12

Water Distribution System	Population	Count
Very Large	> 50,000	1
Large	15,001- 50,000	2
Medium	1,501 - 15,000	41
Small	501 - 1,500	82
Very Small	≤ 500	358
Unknown	variable	30
Total		514

To address these challenges, the province continues to encourage the implementation of regional water systems and regional water system operators wherever needed and feasible.

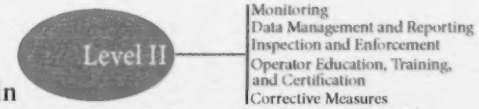
Regardless of the size of the distribution system, ongoing infrastructure maintenance is required to ensure both reliable hydraulic capacity and safe drinking water. Proper maintenance depends on operator knowledge and adherence to best management practices and operational procedures. The Department of Environment and Conservation addresses this requirement through its Operator Education, Training, and Certification (OETC) program. Proper maintenance prolongs the life of a water distribution system and reduces the frequency of leaks and breaks. Nevertheless, at some point repairs and replacements are necessary, and the financial cost can be substantial. During the 2011–12 fiscal year, the Department of Municipal Affairs approved $ 17,543,000 for water related projects. Table 5 provides a breakdown of initiatives for the April 1, 2011 to March 31, 2012 fiscal year. The Provincial share less GST amounts are shown.

Table 5: Funding Approved by Department of Municipal Affairs

Category	*Funding ($)
New Water Distribution	2,850,000
Upgrades to Water Distribution	8,750,000
New Drinking Water Treatment	63,000
Upgrades to Drinking Water Treatment	1,350,000
Studies	110,000
**DWSI/PWDU	4,420,000
Total	17,543,000

**Provincial share less GST amounts shown*
***Drinking Water Safety Initiative/Potable Water Dispensing Units.*

Level II



The standard of performance achieved in Level I of the MBSAP is verified through the components of Level II, increasing overall protection of the province's drinking water.

The five components in Level II of the MBSAP are:

1. monitoring
2. data management and reporting
3. inspection and enforcement
4. operator education, training, and certification
5. corrective measures

This section of the report outlines Government's activities in each of the Level II components during the 2011–12 fiscal year.

Monitoring

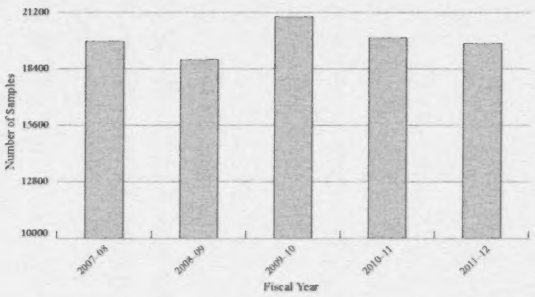
Drinking water quality monitoring consists of regular sampling of drinking water from both the source and the tap. The purpose of collecting drinking water samples is to test for parameters that may affect human health or the aesthetic quality of drinking water. In addition to its province-wide monitoring activities, the Department of Environment and Conservation's Water Resources Management Division also designs special monitoring programs to address site-specific characteristics or emerging water quality issues. Communities are encouraged to monitor specific water quality parameters themselves for operational purposes in water treatment plants, or if a specific parameter is of local concern.

Long-term monitoring of drinking water quality has many benefits, including identifying trends and changes in a community's water quality and allowing for design of water treatment systems if needed. Long-term monitoring allows the Government of Newfoundland and Labrador to identify issues and determine if source protection needs to be reviewed or corrective measures introduced or revised. The extensive monitoring program for drinking water quality in the province is a joint responsibility shared by the Department of Environment and Conservation and Service NL.

Bacteriological Water Quality

Under the direction of Service NL, Environmental Health Officers collect tap samples from public drinking water supplies for analysis of bacteriological parameters. The parameters monitored include total coliforms and *Escherichia coli* (*E. coli*). During the 2011–12 fiscal year, 19,634 bacteriological samples were collected and tested. Figure 7 shows the total number of bacteriological samples that were collected and tested for each fiscal year since 2007–08.

Figure 7: Bacteriological Samples Tested per Fiscal Year



Bacteriological Parameters: Analysis

Provincial public health laboratories analyze samples for bacteriological parameters. Samples are also tested at affiliated regional testing locations. The province compares the results to its own bacteriological standards (outlined in Standards for Bacteriological Quality of Drinking Water). The number of

bacteriological samples tested at each public health authority affiliated regional location is shown in Table 6.

Table 6: Number of Bacteriological Samples Tested in Each Region for 2011–12

Region sampled	Count
St. John's Region	8,118
Central Region	4,066
Western Region	3,803
Northern Region	2,255
Eastern Region	1,392
Total	19,634

Bacteriological Parameters: Results

Based on the analysis of bacteriological parameters for public drinking water samples taken during the 2011–12 fiscal year, 844 were found to be unsatisfactory in terms of total coliforms. Table 7 shows the number of samples found to be unsatisfactory for total coliforms, at each public health authority affiliated regional location, for the fiscal year 2011–12.

Table 7: Number of Unsatisfactory Samples for Total Coliforms for 2011–12

Region Tested for Total Coliforms	Unsatisfactory Samples
St. John's Region	254
Central Region	239
Western Region	169
Northern Region	99
Eastern Region	83
Total	844

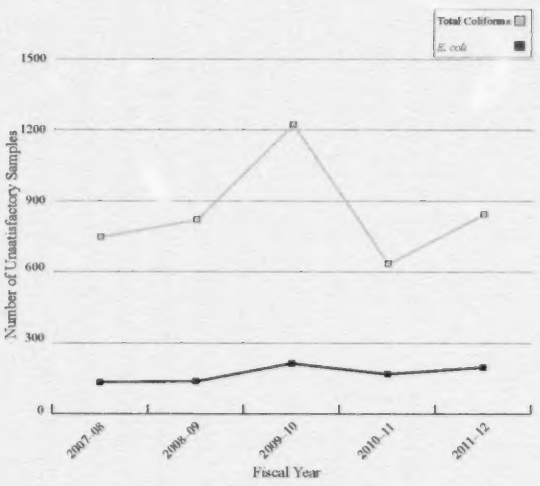
There were 196 bacteriological samples tested that were found to be unsatisfactory in terms of *E. coli**. Table 8 shows the number of samples found to be unsatisfactory for *E. coli.*, at each public health authority affiliated regional location, for the fiscal year 2011–12.

Table 8: Number of Unsatisfactory Samples for *E. coli* for 2011–12

Region Tested for *E. coli*	Unsatisfactory Samples
St. John's Region	47
Central Region	31
Western Region	66
Northern Region	30
Eastern Region	22
Total	196

The number of unsatisfactory samples for Total Coliforms and *E. coli* for each fiscal year since 2007–08 is shown in Figure 8.

Figure 8: Unsatisfactory Bacteriological Samples per Fiscal Year



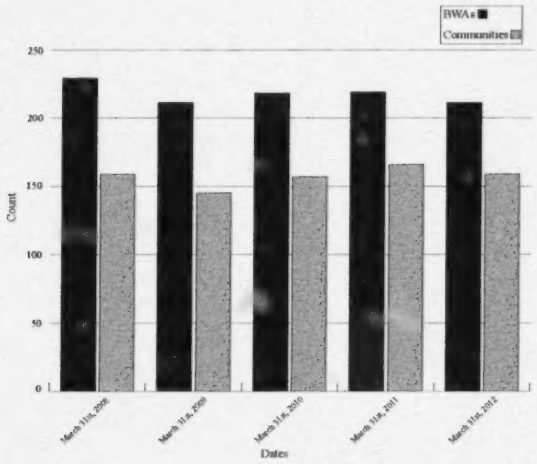
**Escherichia coli (E. coli) is considered a good indicator of recent fecal contamination of drinking water and the possible presence of disease causing microorganisms.*

Boil Water Advisories

Boil water advisories (BWAs) are preventative measures for protecting public health from waterborne microbiological contamination that may, or are known to be, present in drinking water. A BWA is issued when water quality is questionable due to operational deficiencies (such as inadequate chlorine residual), no disinfection system or the water in a community's water system is contaminated with faecal pollution indicator organisms (such as total coliforms).

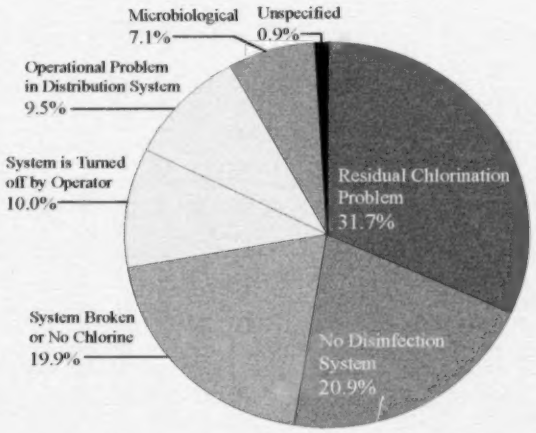
When discussing BWAs for the purpose of this annual report, we are referring to BWAs in effect at the end of the fiscal year, March 31, 2012. Figure 9 shows a historical comparison of BWAs per end of the fiscal year.

Figure 9: Number of BWAs and Number of Communities Affected



On March 31, 2012, 211 BWAs were in effect, affecting 159 communities in the province, with an impacted population of 52,381. Figure 10 illustrates the distribution of BWAs by reason used to issue the advisory for the 2011–12 fiscal year.

Figure 10: Reasons for BWAs



Long term BWAs, are BWAs that have been in effect for a period of five years or greater. A total of 138 BWAs have been in effect for a period of five years or greater at the end of the 2011–12 fiscal year.

The Department of Environment and Conservation's *Guidelines for the Design, Construction and Operation of Water and Sewerage Systems* require the following conditions to ensure the microbiological safety of drinking water:

1. All public water supply systems must be continuously disinfected.
2. All water entering the distribution system, after a minimum 20 minute contact time, shall contain a residual disinfectant concentration of free chlorine of at least 0.3 mg/L, or equivalent CT value.
3. Water which is primarily disinfected by means other than chlorination must be provided with residual chlorine sufficient to maintain a detectable residual as per condition 4 below.
4. A detectable residual disinfectant (either free or total chlorine) must be maintained in all points in the distribution system.

Chemical and Physical Water Quality

The Department of Environment and Conservation's Water Resources Management Division monitors drinking water quality for a number of chemical and physical parameters for all PWSs in the province. Samples for physical and chemical analysis are taken from the source water (lake, pond, river, reservoir, or well) and from the distribution system (tap samples). They are classified as:

- inorganics (metals, nutrients, physical parameters, and major ions)
- disinfection by-products (trihalomethanes and haloacetic acids)
- emerging or special parameters (for example, hydrocarbons)

Historical data for most inorganic and disinfection by-product monitoring is analyzed prior to planning the annual drinking water sampling schedule in April of each year. The schedule is designed around drinking water quality issues, water treatment systems, disinfection systems, and special parameter sampling programs. The minimum monitoring requirements for all public water supplies are:

- for tap water, inorganic samples are collected twice a year
- for source water, the department normally collects inorganic samples for a water supply every third year

The department collects samples for disinfection by-products (DBPs) four times a year from surface water supplies that use chlorination as a disinfectant.

Guidelines for these disinfection by-products are based on locational annual running averages, which is an average value obtained from four samples per year over four seasons. These parameters typically do not form in groundwater because groundwater contains minimal organic matter. Groundwater sampling for these parameters is only completed for new public groundwater wells to gather baseline information. If DBPs are identified as an issue in a specific groundwater supply, then WRMD staff will monitor that groundwater supply four times per year.

The number of samples taken per region for 2011–12 are presented in Table 9.

Table 9: Number of Samples Taken by ENVC for 2011–12

Region	Source	Tap	THM	HAA	Total
Eastern	43	446	435	430	1,354
Western	156	334	380	380	1,250
Central	61	218	324	322	925
Labrador	31	57	86	86	260
Other (special)	9	6	5	5	25
Totals	300	1,061	1,230	1,223	3,814

In 2011–12, the Department of Environment and Conservation collected 3,814 samples. Additional samples may also be taken for communities due to community concerns, special monitoring programs or water quality studies. 97 percent of the samples that were scheduled for this fiscal year were collected. Table 10 shows the number of samples scheduled and the number actually taken for 2011–12. Figure 11 shows the percent compliance of ENVC's sampling schedule for each fiscal year since 2007–08.

Table 10: Number of Samples Scheduled and Collected by ENVC for 2011–12

Type of Sample	Scheduled	Collected	Percent
Tap Water Sample	1,077	1,061	99
THM Water Sample	1,268	1,230	97
HAA Water Sample	1,268	1,223	96
Source Water Sample	302	300	99
Total	3,915	3,814	97

The reasons that some samples were not taken are as follows:

- safety (source samples)
- town was not chlorinating at the time of sampling (THM and HAA samples)
- water supply not operating at the time of sampling (tap, THM and HAA samples)
- no sample location available at the time of sampling (very small systems)

Chemical and Physical Parameters: Analysis

Following the collection of drinking water quality samples, the Department of Environment and Conservation submits the samples to an external accredited laboratory for analysis. The accredited designation ensures that the laboratory provides quality and competency in its sample analysis. The accredited laboratory is selected using the public tendering process.

In 2001, the province of Newfoundland and Labrador adopted the *Guidelines for Canadian Drinking Water Quality* (GCDWQ) as a standard to ensure clean and safe drinking water. These guidelines are published by Health Canada and are updated as necessary. The health-based guidelines have been developed for various chemicals, DBPs, micro-organisms and physical parameters found in Canadian drinking water supplies. As well, the guidelines consider aesthetic effects and treatment processes/technologies.

The ENVC remains vigilant in the application of the most up to date guidelines.

Chemical and Physical Parameters: Results

Results for chemical and physical parameters are sent to the Department of Environment and Conservation when laboratory analysis is complete. The department then evaluates the results by comparing them to current GCDWQ. Source water results are compared to the GCDWQ to identify both drinking water treatment needs and corrective measures that may need to be taken. Tap water samples are compared to the GCDWQ to identify exceedances in chemical and physical parameters that may pose a risk to human health or aesthetic approval of drinking water. When an exceedance is confirmed for a parameter that may pose risk to human health, an exceedance report is sent immediately to the community, Departments of Health and Community Services, Municipal Affairs and Service NL. Exceedances for aesthetic parameters are also reported to communities, along with all other parameter results, in quarterly Drinking Water Quality Reports. The WRMD's sampling and reporting procedures are outlined in the Drinking Water Quality Monitoring Manual, which can be viewed online at: *http://www.env.gov.nl.ca/env/waterres/quality/drinkingwater/manual.html*.

Figure 11: Percent Compliance of ENVC's Sampling Schedule per Fiscal Year

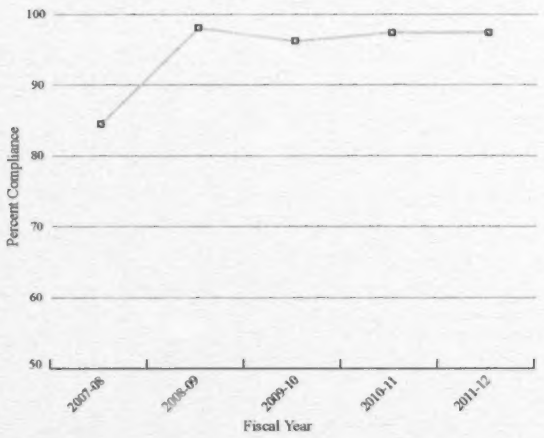


Table 11 summarizes the tap water bacteriological, chemical and physical parameter exceedances for the 2009–10, 2010–11 and 2011–12 fiscal years.

Table 11: Exceedances for the 2009–10, 2010–11 and 2011–12 Fiscal Years

Department	Exceedances				
	Parameters		2009–10	2010–11	2011–12
Service NL	Bacteriological	*Escherichia coli*	212	167	196
		Total coliforms	1222	633	844
Environment and Conservation	Chemical and Physical	Turbidity	64	106	98
		Arsenic	6	5	4
		Barium	2	1	2
		Fluoride	0	2	0
		Lead	4	2	8
	Disinfection By-Products	Trihalomethanes (THMs)	167	126	129
		Haloacetic Acids (HAAs)	184	157	165
	Aesthetic	Colour	462	488	514
		pH	332	235	361
		Total Dissolved Solids	11	17	11
		Chloride	5	5	3
		Sodium	2	2	3
		Sulphate	3	4	3
		Copper	3	6	11
		Iron	87	91	107
		Manganese	72	70	83

Aesthetic Parameters

Aesthetic parameters pose no direct health or safety concerns, but may reduce the consumer's opinion of the quality of their drinking water based on taste, colour, and/or odour. Aesthetic parameters can also help determine the operational efficiency of a water system, and may highlight a need to make operational changes to the disinfection, treatment, or distribution systems.

In 2011–12, several aesthetic parameters exceeded the aesthetic objectives as outlined in the GCDWQ. Aesthetic parameter exceedances included colour, pH, iron and manganese. Colour and pH continue to be the most common type of aesthetic parameter exceedances.

Contaminants

Contaminants are substances that are either known or suspected to cause adverse health effects when they are present in drinking water in amounts greater than the established maximum acceptable concentrations set by the GCDWQ. Treatment technologies for most contaminants are available to control the levels of contaminants in drinking water at an acceptable concentration. In 2011–12, exceedances were detected for arsenic, barium, lead and DBPs. DBPs are the most common contaminants in the province and are attributed to chlorination of waters high in natural organic carbon content.

WRMD staff conducting DBP sampling

There is no standard solution that will address the issue of high DBP levels in drinking water for all communities. There are numerous probable causes that may be contributing to the formation of DBPs, just as there are numerous potential corrective actions that can be taken to address the problem. The difficulty lies in selecting the most appropriate corrective measure in light of what might be contributing to DBP levels. The selected corrective measure must address the issue of DBPs, but it must also be sustainable, i.e. fit the community involved in terms of available resources and other constraints.

The province has developed three tools to help communities improve the levels of DBPs in their drinking water:

1. Best management practices for the control of DBPs
2. Decision making framework for selection of DBPs corrective measures
3. Checklist of community information for DBPs management

Best Management Practices (BMPs) for the control of disinfection by-products can be used to help reduce DBPs for new, upgrading, and existing water distribution systems. These BMPs have been shaped by the understanding developed of THM characteristics and behaviour, the assessment of various corrective measures, and through modeling of water distribution systems. The adoption of BMPs by consultants, owners and operators of water systems, and government departments is the first step towards dealing with DBP issues.

Data Management and Reporting

The large volume of data acquired during the implementation of the various components of the MBSAP must undergo a stringent quality assurance/quality control (QA/QC) process before it can be compiled, analyzed, and

reported to the public. The WRMD strives to collect quality data and report it to the public in an open and timely manner.

The data management and reporting process ensures that decision makers and the general public have access to the necessary information about their drinking water quality. This allows communities to address any issues or concerns they have about their drinking water or proposed corrective actions.

The database is a critical component in the management and reporting of drinking water quality data. It contains the results of every drinking water sample taken in the province, under the Department's drinking water quality monitoring program. The database also stores other necessary information used in program management such as status of protected public water supplies, drinking water quality index rankings and special parameters.

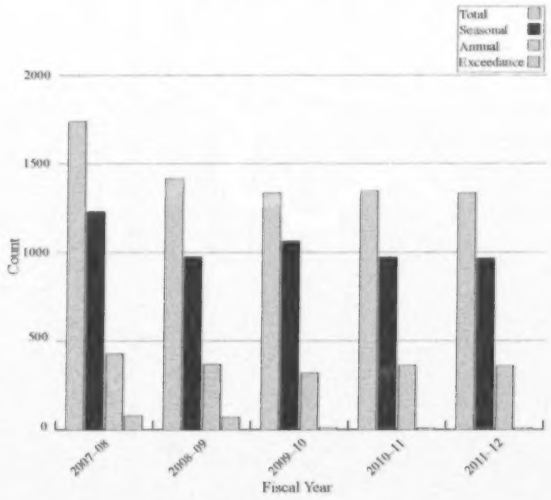
Data management is essential to ENVC's drinking water quality program and is constantly evolving to meet the needs of related programs. The WRMD continues to focus on using its enterprise–level database and web service technology to ensure that the most current and accurate data is available.

As part of ENVC's commitment to report drinking water quality data to the public in an open and timely manner, WRMD distributes a number of reports for communities and the general public. Table 12 summarizes the reports used to communicate the results from programs related to drinking water quality. Figure 12 contains the number of each report type published by ENVC for each fiscal year since 2007–08.

The most frequent method of reporting used by ENVC is the seasonal drinking water quality report, sent out after each drinking water monitoring season. Depending on the type of sampling performed, these reports can contain results for samples collected at the source (for chemical and physical parameters) or at the tap (for chemical and physical parameters, THMs, HAAs). The reports compare sample results to the GCDWQ and note any exceedances. These reports also include two summary indices:

1. Water Quality Index (WQI)
2. Langelier Index

Figure 12: Number of Reports Published by ENVC per Fiscal Year



Drinking Water Quality Index

A Water Quality Index (WQI) is a means by which water quality data is summarized for reporting to the public in a consistent manner. It is similar to the UV index or an air quality index, and it tells us, in simple terms, what the quality of drinking water is from a drinking water supply. Essentially the WQI is calculated by comparing the water quality data to *Guidelines for Canadian Drinking Water Quality*. The WQI measures the scope, frequency, and amplitude of water quality exceedances and then combines the three measures into one score. This calculation

produces a score between 0 and 100. The higher the score the better the quality of water. The scores are then ranked into one of the five categories described below:

- Excellent: (WQI Value 95-100) - Water quality is protected with a virtual absence of impairment; conditions are very close to pristine levels. These index values can only be obtained if all measurements meet recommended guidelines virtually all of the time.
- Very Good: (WQI Value 89-94) - Water quality is protected with a slight presence of impairment; conditions are close to pristine levels.
- Good: (WQI Value 80-88) - Water quality is protected with only a minor degree of impairment; conditions rarely depart from desirable levels.
- Fair: (WQI Value 65-79) - Water quality is usually protected but occasionally impaired; conditions sometimes depart from desirable levels.
- Marginal: (WQI Value 45-64) - Water quality is frequently impaired; conditions often depart from desirable levels.
- Poor: (WQI Value 0-44) - Water quality is almost always impaired; conditions usually depart from desirable levels.

WQI scores are computed for each public water supply system that has been sampled during a sampling season. The same variables are used in the computation of the WQI for all public water supply systems and only the six most recent samples are used.

However if a public water supply system is on a boil water advisory, or it has a current contaminant exceedance, or has THM and/or HAA averages above the drinking water quality guideline, a WQI score is not computed.

The WQI is a summary tool and the Department does not intend to use the WQI to replace detailed analysis of drinking water quality data. The Department continues to closely monitor and analyze drinking water quality to protect drinking water safety on a proactive basis.

Langelier Index

The Langelier Index is one of the tools used by a water system operator to stabilize water so that both the internal corrosion of the piping system and deposition of scale can be controlled. The Langelier Index can fluctuate frequently. Operators can control various parameters throughout the life of the distribution system to regulate Langelier Index readings, such as pH. The Langelier Index does not indicate the overall quality of drinking water in the system.

Contaminant Report Protocol

A second key reporting function is the contaminant exceedance reporting protocol. This protocol is activated when sample analysis indicates the presence of a contaminant in a concentration that is above the maximum acceptable concentration listed in the GCDWQ. The reporting protocol continues to be successful in ensuring prompt communication with communities and appropriate government departments.

Under the contaminant exceedance protocol, the laboratory performing the drinking water quality sample analysis is required to notify the department as soon as it detects any contaminant exceedances. The department sends the laboratory an immediate confirmation of receipt and initiates site analysis to determine if the contaminant exceedance requires a resample. Following the site analysis, an exceedance report is issued to the community explaining the exceedance and whether or not

Table 12: Types of Public Reports Produced by ENVC

Type	Description
Seasonal Drinking Water Quality Reports	All communities with public water supplies are provided with an interpreted report if seasonal monitoring has been conducted. These reports clearly indicate any parameters that exceed the *Guidelines for Canadian Drinking Water Quality*. The province recommends that communities post these reports in public locations. In the 2011–12 fiscal year, 964 seasonal reports were mailed out.
Exceedance Report	Exceedance reports are provided to communities when a laboratory result is above the *Guidelines for Canadian Drinking Water Quality* for contaminant parameters. These reports are faxed and/or mailed to the affected community as soon as the department receives the results. In the 2011–12 fiscal year, 10 exceedance reports were sent out to communities.
Annual Drinking Water Quality Reports	All communities with public water supplies are sent an annual interpreted report for all drinking water quality monitoring activities conducted during the calendar year. This report clearly indicates any parameters that exceed the *Guidelines for Canadian Drinking Water Quality*. The province recommends that communities post these reports in public places. In the 2011–12 fiscal year, 361 annual reports were mailed out.
Annual Drinking Water Safety in Newfoundland and Labrador Report	The Annual Drinking Water Safety in Newfoundland and Labrador Report has been published each year since 2001. It outlines accomplishments and activities under the Multi-Barrier Strategic Action Plan for drinking water safety in a particular fiscal year
Web Documents on Drinking Water Quality	The WRMD's website is an important tool for communicating with the public. It is updated regularly with new information on drinking water quality and related topics. The "What's New" screen, which lists the most current information, is online at: *http://www.env.gov.nl.ca/env/waterres/whatsnew/index.html*

a resample is required. This report is copied to members of the Departments of, Health and Community Services, Municipal Affairs and Service NL.

Inspection and Enforcement

Inspection and enforcement activities help to ensure minimum requirements for the construction and modification of drinking water systems are upheld through regulation of the approval process.

Permits

Under the *Water Resources Act*, the Department of Environment and Conservation

has the authority to issue permits relating to different aspects of drinking water protection under the MBSAP. These include:

- permits to construct water and sewage works under Section 36 and 37 of the Act
- permits to operate water and sewage works under Section 38 of the Act
- permits for development activity in a protected water supply area under Section 39 of the Act
- non-domestic well permits under Section 58 of the Act

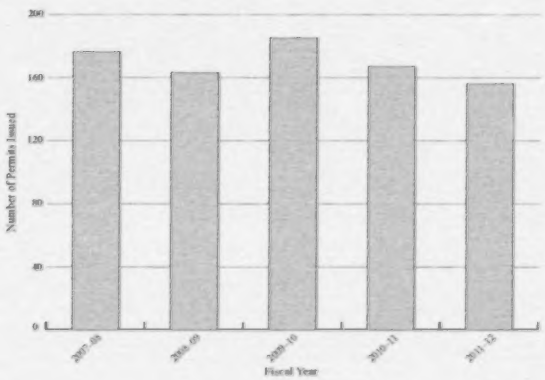
The Department of Environment and Conservation's permitting process ensures adequate review of proposed work to determine if it meets provincial standards and guidelines. The inspection of projects and the enforcement of permits that have been issued by the Department ensure that projects are in compliance with the conditions outlined in the permits.

The design and construction of all water and sewage infrastructure in the province requires an approval from the Minister of Environment and Conservation. The permit to construct is issued to the owner of the infrastructure and outlines standard requirements and any special conditions necessary to govern the installation of the works. The normal process is that a licensed professional engineer submits a design on behalf of a community which is reviewed for compliance with the Department of Environment and Conservation's *Guidelines for the Design, Construction and Operation of Water and Sewerage Systems.* If acceptable, a permit to construct is issued. During the 2011–12 fiscal year, the Department of Environment and Conservation issued 156 permits to construct for water and sewer infrastructure. Figure 13 shows the number of permits to construct issued for each fiscal year since 2007–08.

The permit to operate is designed to focus the awareness of municipal government leaders and operators on the activities required to develop and practice proactive operation and maintenance of their drinking water infrastructure. Permits to operate are issued in four different areas: water distribution, water treatment, wastewater collection, and wastewater treatment. In the 2011–12 fiscal year, the department issued two permits to operate. The total number of active permits to operate, at the end of the 2011–12 fiscal year, was 330 permits to operate water distribution systems and 16 permits to operate water treatment systems.

Permits are also required, under Section 58 of the *Water Resources Act* to drill a non-domestic well and must be obtained before construction begins. 38 non-domestic well permits were issued during the fiscal year for various uses which includes public water supplies.

Figure 13: Number of Permits to Construct per Fiscal Year



Inspections/Investigations

The *Water Resources Act* states that a permit holder shall allow inspectors to carry out inspections of an activity for which a license or permit has been issued. Investigations can also occur once the Department of Environment and

Conservation is made aware of a contravention of the *Water Resources Act* or associated regulations and permits. The Department of Environment and Conservation requires that all public waterworks be maintained and operated sustainably, as prescribed by the *Water Resources Act*. Departmental staff conduct inspections of water supply systems under construction, the operation of water treatment and distribution systems, groundwater wells being drilled, and activities taking place in PPWSAs to ensure that they comply with the terms and conditions of their permit. Communities may conduct routine surveillance and monitoring of approved development activities within PPWSAs to ensure existing development activities are being conducted in an environmentally acceptable manner and to ensure that there are no development activities taking place without prior approval from the department.

Investigations are typically issue-specific. Additionally, the Minister may order studies, monitoring, or investigations for the purpose of collecting data and information that the Minister considers necessary in the interest of the conservation, development, control, improvement and proper utilization of water resources.

In the 2011–12 fiscal year, departmental staff carried out a total of 149 inspections/ investigations. In addition, staff visit public water supplies two to four times a year during scheduled monitoring work. Table 13 presents a breakdown of inspections for 2011–12.

Table 13: Inspections by ENVC for 2011–12

Inspection Type	Count
Water and Sewer Construction	66
Protected Surface Water Supplies	22
Water System Operation	12
Protected Groundwater Supplies	49
Total	149

Enforcement

One of ENVC's main goals is to ensure communities achieve clean and safe drinking water in a sustainable and efficient manner. When non-compliance with the conditions of a permit is reported, WRMD responds to enforce the permit.

Operator Education, Training, and Certification

Certified operators are integral to the proper operation and maintenance of the systems that supply clean and safe drinking water to the consumer. Through continuing education, training, and certification, the Department of Environment and Conservation is addressing the need for qualified operators of drinking water treatment and distribution systems in this province.

Providing opportunities for ongoing training and education to operators of municipal drinking water systems is a major component of the MBSAP. Recognizing this, the Department of Environment and Conservation developed a unique approach to meet the training needs of operators across the province through the development of the Operator Education, Training, and Certification (OETC) program. The OETC program is the first of its kind in Canada, and was specifically designed to meet the needs of the province's small rural communities.

A new policy for certification of operators in the province, "Policy for Newfoundland and Labrador Water and Wastewater Operator Certification Program," was issued in January, 2012.

The OETC program provides operators with education and hands-on training opportunities that are focused on four key areas:

- job competency

- drinking water safety
- environmental protection
- infrastructure sustainability

The education component of the OETC program takes place in a classroom-like setting. Seminars are designed to provide operators with the theory and knowledge that will allow them to successfully operate their water systems. Seminars are free of charge, and locations are chosen to minimize travel time and costs for participants.

The curriculum of the education program focuses on topics such as:

- water distribution system basics
- water distribution system hydraulics
- water quality issues
- water treatment level I and level II
- proper handling of chlorine and chlorine containers

During the 2011–12 fiscal year, the OETC funded a Groundwater, Wells and Well Pumps course delivered by the Walkerton Clean Water Centre, and a water chemistry course delivered by LEXICON Environmental Consulting.

The need to provide operator education opportunities through the OETC program remains strong. Communities across the province, many of which are facing challenges of operator retirement and turnover, constantly need to educate new operators. The WRMD is committed to delivering its existing seminars on water distribution and water treatment in the coming years, and to expanding the curriculum as required. During the 2011–12 fiscal year, 14 drinking water related classroom seminars were held at 7 locations across the province.

Operator Training

The operator training program provides municipal drinking water system operators with hands-on training opportunities. The program utilizes three Mobile Training Units (MTUs) that have been equipped with various equipment and tools used in the operation and maintenance of drinking water systems. Training sessions are delivered on-site in the operator's community to maximize accessibility to the training opportunities. During 2011–12, the province's three operator trainers conducted 157 on-site training sessions throughout the province. These sessions were attended by a total of 192 operators.

Currently the on-site training curriculum includes the following sessions:

- disinfection
- hypochlorination
- gas chlorination
- hydrant maintenance
- control valve maintenance
- pipe tapping
- leak detection
- distribution system flushing

Based on the demand from municipal water system operators, a new session, pH adjustment systems, is being developed for incorporation into the program curriculum. A draft of this curriculum was completed during the 2011–12 fiscal year and will be available to operators as an on-site training session during the 2012–13 fiscal year.

WRMD staff members have been designing and constructing a water distribution system working model to augment their hands-on training program. This model will be used in conjunction with training sessions currently being delivered through the MTUs. The first version of the working model was launched at the 2011 Clean and Safe Drinking Water Workshop. Operator Trainers have been revising the working model design and began the construction of the second working model during the 2010–11 fiscal year.

Operator Certification

Certification verifying proper training is an essential component of a safe drinking water system.

Certification of water operators in this province is a responsibility of the OETC program. Certification provides operators with an avenue for demonstrating their knowledge and commitment to their profession. It also provides communities with the assurance that their water systems are operated by qualified and knowledgeable personnel. A new Policy Directive for Operator Certification was signed during the 2011–12 fiscal year. As this report was being prepared, there were 504 certified water and/or wastewater operators in Newfoundland and Labrador, for 32 of these operators, this was their first level of certification achieved. Current certification levels include:

- Water Distribution Operators (Class I, II, III and IV)
- Water Treatment Operators (Class I, II, III, and IV)
- Wastewater Collection Operators (Class I and II)
- Wastewater Treatment Operators (Class I and II)

Figure 14 illustrates the number of certified operators in the province per calendar year since 2008. 356 certified operators are currently employed in the province. Table 14 contains the total number of operator certificates issued per calendar year.

Annual Clean and Safe Drinking Water Workshop

The Annual Clean and Safe Drinking Water Workshop is open to all community operators and administrators. It brings together drinking water quality stakeholders and provides them with opportunities to learn about drinking water safety, to exchange information, and to share experiences. The presentations delivered during this event are carefully chosen to address specific challenges faced by small communities in providing clean and safe drinking water.

The 2012 Clean and Safe Drinking Water Workshop took place on March 27-29, 2012 in Gander. The workshop attracted 318 participants from across the province and country. Figure 15 illustrates the number of attendees at the Annual Clean and Safe Drinking Water Workshop, for each year since 2008. Copies of all presentations delivered as part of the workshop are available on the department's website. The annual event also includes a trade show exhibition which allows operators and municipal administrators to network with equipment suppliers from across the country.

Figure 14: Number of Certified Operators by Calendar Year

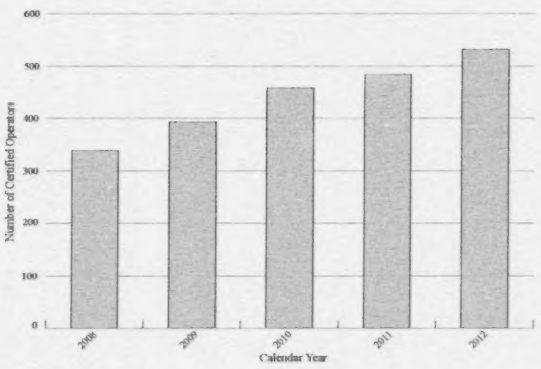


Table 14: Total Number of Operator Certificates Issued per Calendar Year

Calendar Year	2008	2009	2010	2011	2012
Water Distribution	15	88	80	15	58
Water Treatment	17	3	7	13	26
Wastewater Collection	74	28	15	13	10
Wastewater Treatment	26	1	4	29	1
Total Certificates	132	120	106	70	95

Continuing Education Opportunities for Groundwater System Operators

The Operator Education, Training and Certification (OETC) Program was initiated in 2001 under the mandate to provide job-competency based education and training opportunities to operators throughout the province. The training opportunities offered through the OETC program have evolved in response to the training needs of operators. Additional education seminars and on-site training sessions have been added to the curriculum. Despite these additional efforts, the program recognized there was a need for advanced specialty courses for operators to attain a higher level of knowledge.

In June 2011, the Department sponsored a Groundwater: Wells and Well Pumps course that was delivered by Mr. Tim Lotimer of the Walkerton Clean Water Centre. Thirteen water system operators from communities across the province participated in this interactive course. The instructor incorporated a hands-on component to the course, including demonstrations of various tools, equipment and well inspection videos. The feedback from the participants was very positive, and those in attendance gained a lot of knowledge regarding proper operation and maintenance of groundwater systems. This course will be offered in 2012.

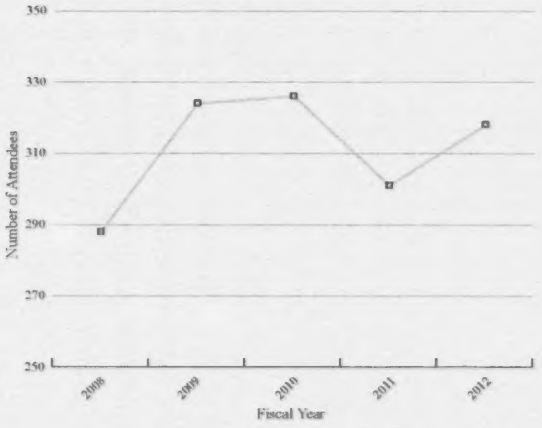
At the 2012 workshop, companies showcased a variety of technologies and services related to water distribution and treatment. The Department of Municipal Affairs once again provided financial assistance to municipalities to cover travel costs associated with attending the workshop. Communities from the Island portion of the province that were approved for the subsidy were reimbursed up to $400, and communities from Labrador that were approved for the subsidy were reimbursed up to $700. The Department of Municipal Affairs increased the subsidies in comparison to past years.

The next Annual Clean and Safe Drinking Water Workshop is scheduled for March 26th to 28th, 2013.

Corrective Measures

The Level II components of the MBSAP just discussed, provide an ongoing picture of drinking water supply, quality, and infrastructure. The issues identified require the implementation of corrective actions to deal with these issues. Corrective measures can include structural, non-structural, or operational techniques and other best management practices.

Figure 15: Number of Workshop Attendees per Fiscal Year



There are five classes of corrective measures: policy, design, water system management, water treatment alternatives, and source alternatives. Table 15 shows the progress made in each category of corrective measures.

Table 15: Corrective Measures Undertaken for 2011–12

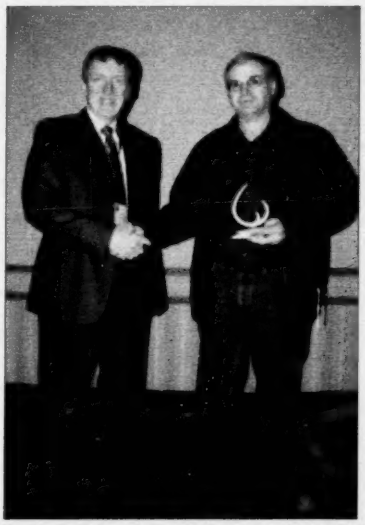
Corrective Measure	Description
Policy	• Year 11 of the Multi-Barrier Strategic Action Plan for Safe Drinking Water in NL • Policy for Newfoundland and Labrador Water and Wastewater Operator Certification Program issued
Design	• 6 technical studies completed
Water System Management	• Ongoing operator education, training and certification • Permits to Construct issued relating to water system management o Water main upgrades and replacement– 33 o New or upgraded pumps– 9 o New tanks or upgrades to tanks– 3 o New contact tanks or pipe– 2 o New or upgraded valves– 3 • 3 community assessments undertaken in response to drinking water quality issues • 4 Standard Operating Procedures for municipal water system operators developed for: o Self Contained Breathing Apparatus o Chlorine Gas Sensors o Water System Valves o Water Storage Tanks
Water Treatment Alternatives	• Permits to Construct issued relating to water treatment o New chlorination systems– 9 o Chlorination system upgrades– 5 o New mixed oxidant system- 1 o New filtration systems– 1 o New pH adjustment systems– 1 o New PWDU– 5 o New water treatment plant– 1 o Water treatment plant upgrades– 1 • Study on NL water treatment plants underway
Source Alternatives	• Permits to Construct issued relating to water sources o New or upgraded Infiltration gallery– 4 o New wells– 2 o New or upgraded intakes– 6 • 119 public wellhead inspections undertaken

2012 Operator of the Year Awards

The Department of Environment and Conservation created the Operator of the Year Awards to recognize the outstanding dedication of municipal operators in providing clean and safe drinking water. Community representatives across the province were invited to nominate an operator they felt had made an outstanding contribution. In total, 27 nominations were submitted to the selection committee for consideration in two categories: Volunteer Operator of the Year and Operator of the Year.

The Volunteer Operator of the Year Award was created to honour an individual that operates a municipal drinking water system without any monetary compensation. The 2012 Award was presented to Mr. Kevin Butt from the Local Service District of Fairbanks-Hillgrade. Mr. Butt has been a volunteer with the community for 31 years and is responsible for the operation, maintenance and repair of the water system, including chlorination facility. His dedication to the residents of Fairbanks-Hillgrade has not gone unnoticed and they believe he is very deserving of the Volunteer Operator of the Year Award.

The 2012 Operator of the Year Award was presented to Mr. Harold Power, Public Works Supervisor for the Town of Placentia. Mr. Power has been responsible for operating the town's drinking water systems since 1983. Since that time, his duties and responsibilities have grown to include operation and maintenance of the Town's ozone water treatment plant, pumping stations, disinfection facilities, sewage lift stations, etc. Mr. Power is a frequent participant in training opportunities and has achieved his Water Distribution Level 2, Water Treatment Level 1, and Wastewater Collection Level 1 certifications. The Town of Placentia were pleased to nominate Harold Power for the Operator of the Year Award.



Assistant Deputy Minister of ENVC with the 2012 Volunteer Operator of the Year recipient, Mr. Kevin Butt

Assistant Deputy Minister of ENVC with the 2012 Operator of the Year recipient, Mr. Harold Power

Level III

The management of drinking water is multifaceted and depends on the contribution of several levels of government as well as the public.

The four components in Level III of the MBSAP are:

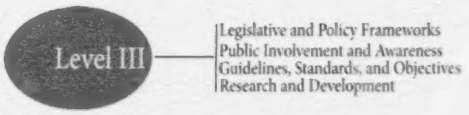
1. legislative and policy frameworks
2. public involvement and awareness
3. guidelines, standards and objectives
4. research and development

Legislative and Policy Frameworks

The legislation that governs drinking water quality in the province includes the *Water Resources Act*, the *Municipal Affairs Act*, and the *Municipalities Act*. All of the legislation, policy directives, standards, and regulations are posted on the province's website. These three Acts contain broadly stated initiatives:

- the *Water Resources Act* regulates the administration of water rights, the protection of public water supply areas, and a range of construction and development permits pertaining to drinking water infrastructure and development that may impact public water supplies
- the *Municipal Affairs Act* administers the management of waterworks
- the *Municipalities Act* grants powers to municipalities for the construction, operation, and maintenance of water systems and for the allocation of funds for this work

Government also introduces regulation and policy directives to provide more explicit direction for legislation.



Interdepartmental Cooperation

The provincial government's efforts to provide clean and safe drinking water are the result of the combined contributions of four departments: the Department of Environment and Conservation (acting as the lead agency), Health and Community Services, Municipal Affairs, and Service NL. Each department is responsible for one or more components of the MBSAP. Their efforts are coordinated by an interdepartmental committee of deputy ministers, which is chaired by the Deputy Minister of the Department of Environment and Conservation. The committee's work is supported by the Interdepartmental Safe Drinking Water Technical Working Group, which was formed in June 2000. The working group is chaired by the Department of Environment and Conservation, and includes representatives from the Departments of Health and Community Services, Municipal Affairs, and Service NL. Medical Officers of Health and representatives from the Public Health Laboratory are also members of the working group. The working group met twice in 2011–12, with all activities reported to the chair of the Steering Committee of Senior Government Officials. The committee leads work on the development of policy and guidelines specifically in the area of microbiological safety. It is responsible for the establishment of the hierarchal coding of BWAs. It also conducts QA/QC and groundtruthing of BWAs.

In 2011–12, the committee focused on the QA/QC of BWAs, and the implementation of the MBSAP for drinking water safety in Newfoundland and Labrador.

Public Involvement and Awareness

The Department of Environment and Conservation continues to provide easily accessible and timely drinking water quality information to the public. The department's website is a major tool for increasing public awareness and encouraging public involvement. A new Drinking Water Outreach Video addressing common questions regarding permits to construct can be accessed on the department's website at: *http://www.env.gov.nl.ca/env/waterres/waste/community.html.*

Watershed management committees are another way the public can participate in efforts to ensure clean and safe drinking water supplies. They are excellent forums in which stakeholders can voice opinions and concerns about land management and water quality issues in their watershed areas. The establishment of watershed management committees furthers the Department of Environment and Conservation's goal of increasing public involvement and awareness of drinking water safety issues.

Guidelines, Standards, and Objectives

To ensure clean and safe drinking water, the Department of Environment and Conservation sets drinking water safety guidelines, standards, and objectives, and regularly reviews and updates them to address current issues and challenges.

Research and Development

In order to stay on top of current and emerging issues that affect drinking water safety, the Department of Environment and Conservation undertakes several research and development activities each year.

Final drafts for a number of technical studies under the Rural Drinking Water Safety Initiative were completed during the 2011–12 fiscal year:

- study on pH Adjustment Systems and Recommendations for Design and Operational Guidelines
- study on Water Quality and Demand on Public Water Supplies with Variable Flow Regimes and Water Demand
- study on Regional Groundwater Chemistry Mapping for the Island of Newfoundland
- study on Drilled Well Database Evaluation and Correction
- study on Pathogenic Inactivation in Drinking Water Systems in Newfoundland and Labrador
- study on Characteristics and Removal of Natural Organic Matter in Drinking Water Systems in Newfoundland and Labrador

The Department of Health and Community Services drafted guidelines for issuing public water supply non-consumption advisories for implementation in 2012–13. Additionally, the Department will continue its retrospective review of private water quality during the year.

The Path Forward

Department of Environment and Conservation

The Department of Environment and Conservation will continue to pursue its commitment to develop and strengthen all levels and components of the Multi-Barrier Strategic Action Plan.

The department's drinking water monitoring activities for the 2012–13 fiscal year are planned as follows: 3,839 drinking water quality samples scheduled for collection and analysis.

- 201 source water samples, which will be analyzed for inorganic chemical parameters
- 1,046 tap water samples, which will be analyzed for inorganic chemical parameters
- 1,296 tap water samples, which will be analyzed for trihalomethanes
- 1,296 tap water samples, which will be analyzed for haloacetic acids

The department will continue to provide education and hands-on training opportunities to water system operators. The following education seminars have been targeted for development:

- potable water dispensing unit operation and maintenance
- NL water resources portal training for communities and orientation session for municipal staff will be launched in 2012–13
- training sessions to assist communities with the understanding of their Drinking Water Quality Reports (combined with NL water resources portal training)
- water distribution system flushing
- pumps and pumping will be launched in 2012–13

Other priority areas for future development include:

- delivering drinking water related education and on-site training sessions focused on new operators and communities facing drinking water challenges
- providing specialty courses to respond to the training needs of water operators throughout the province - During the 2012–13 fiscal year we will be funding two specialty courses, (1) Groundwater, Wells and Well Pumps and (2) Water Treatment Level 3 and 4 Exam Preparation.
- construction of an additional two training units for MTU's stationed in the Eastern and Central regions of Newfoundland and Labrador. With completion of the second model scheduled for 2012–13, and a third to follow.

A new watershed management guide is under development for municipalities and local service districts who have a designated Protected Water Supply Area but lack a Watershed Management Committee or Watershed Management Plan.

The 2012 Clean and Safe Drinking Water Workshop is scheduled for March 26 - 28, 2013 in Gander. The department looks forward to sharing information and experiences with the various stakeholders involved in providing clean and safe drinking water to the people of the province.

Department of Health and Community Services

Through the Newfoundland and Labrador Public Health Laboratory and regional drinking water testing locations, water samples from municipal and private supplies are tested for the bacteriological indicators *E. coli* and total coliform bacteria.

Nominees and recipients of the 2012 Operator, and Volunteer Operator of the Year awards

In 2012–13 the Department of Health and Community Services and the four Regional Health Authorities will continue with their drinking water safety initiatives by working collaboratively with provincial and municipal partners to maintain, and enhance where possible, drinking water related health protection efforts and disease prevention initiatives.

Key areas of focus are to:

- Provide policy and technical support to Environmental Health Officers with Service NL who perform bacteriological water quality monitoring, interpret bacteriological water quality test results and issue boil water advisories.
- Review boil water advisory guidelines, and revise where necessary.
- Review drinking water safety promotional materials, and revise where necessary.
- Drinking water awareness information is available online at: *http://www.health.gov.nl.ca/health/publichealth/envhealth/drinkingwater.html*
- Provide health-related advice to municipal leaders and residents when unsatisfactory water quality in public water supplies is identified.
- Enhance bacteriological water quality testing with the introduction of new presence/absence test methods for total coliform and *E. coli*.

Department of Municipal Affairs

The Department of Municipal Affairs will continue to financially support requests from communities for the provision of water related infrastructure as well as provide implementation oversight. Cost effective approaches with regard to regionalization of operational and maintenance services also will be encouraged in the way of both advisory and financial support. Appropriate water treatment technology to enable communities to meet the *Guidelines for Canadian Drinking Water Quality* continues to be a priority for capital funding assistance. In this regard, the Department is involved in the province's Drinking Water Safety Initiative. This initiative outlines several options to improve drinking

water safety based on a comprehensive evaluation of every public water supply in the province. A significant component of this initiative includes the installation of potable water dispensing units. These units are small scale water treatment plants from which the residents of small communities are provided high quality drinking water which meet the *Guidelines for Canadian Drinking Water Quality*.

Service NL

Through its bacteriological water monitoring program, Service NL helps ensure that public drinking water is protected from waterborne diseases and is safe for consumption. Its ongoing high level of public water sample collection is an indication of the Department's commitment to a satisfactory level of bacteriological water monitoring and compliance with levels recommended in the province's standards and the *Guidelines for Canadian Drinking Water Quality*.

The Environmental Technician positions will continue to assist the Department's Environmental Health Officers to collect water samples, further securing the safety of the province's public water supplies.

The Department is also interested in improving the surveillance of drinking water that is accessible to the public through means other than municipal/public water supplies, such as via semipublic and institutional supplies. It will continue discussions with the Department of Environment and Conservation on this issue.

As in the past, Service NL will also continue to partner with the Department of Health and Community Services and the Regional Health Authorities. It is important to ensure that Environmental Health Officers can access the highest standard of professional development in their field, particularly in bacteriological water monitoring. Consequently, support for professional development in this area will continue, in cooperation with the Canadian Institute of Public Health Inspectors (Newfoundland and Labrador branch).

Environment and Conservation

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